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(54) Title: COSMETIC COMPOSITIONS (57) Abstract This invention relates to low-irritation profile compositions for skin care containing retinoids.		

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COSMETIC COMPOSITIONS

Field of the Invention

5 This invention relates to skin care compositions containing retinoids which generally improve the quality of the skin, particularly human facial skin. More particularly, the present invention relates to chemically stable skin care compositions comprising an emulsion or in
10 the form of a liposomal, system, which have low irritation profiles. This invention also relates to said compositions containing certain retinoids and to methods of making such compositions.

15 BACKGROUND OF THE INVENTION

 Skin care compositions containing retinoids have become the focus of great interest in recent years. Retinoic acid, also known as Vitamin A acid or tretinoin,
20 is well-known for the treatment of such skin conditions as acne and products containing retinoic acid are commercially available in various forms from the Dermatological Division of Ortho Pharmaceutical Corporation. Such products, for example, include Retin A*
25 creams, an oil-in-water emulsion of retinoic acid containing as an oil-soluble antioxidant, butylated hydroxytoluene (BHT); Retin A* liquid, a solution of retinoic acid in a polyethylene glycol/ethanol solvent employing BHT as an antioxidant; and Retin A* gel, which
30 comprises retinoic acid in a gel vehicle comprising ethyl

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alcohol as the solvent, hydroxypropyl cellulose as the thickener or gelling agent and BHT as an antioxidant. These retinoic acid containing products have proven stable and capable of providing active ingredients after extended periods of storage.

More recently, however, wide use of retinoids has been suggested for treatments other than acne such as, for example, the treatment of skin against photoaging and sun damage. Many individuals who have had a good deal of sun exposure in childhood will show the following gross cutaneous alterations in later adult life: wrinkling, leatheriness, yellowing, looseness, roughness, dryness, mottling (hyperpigmentation) and various premalignant growths (often subclinical). These changes are more prominent in light-skinned persons who burn easily and tan poorly. These cumulative effects of sunlight are often referred to as "photoaging". Although the anatomical degradation of the skin is most advanced in the elderly, the destructive effects of excessive sun exposure are already evident by the second decade. Serious microscopic alterations of the epidermis and dermis occur decades before these become clinically visible. Wrinkling, yellowing, leatheriness and loss of elasticity are very late changes.

The problem of skin aging is addressed in U.S. Patent No. 4,603,146 wherein Vitamin A acid in an emollient vehicle is suggested as a treatment. Further, in U.S. Patent No. 4,877,805, it is suggested that a number of

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retinoids are useful for restoring and reversing sun damage of human skin.

When considering the use of retinoids in skin care products, it is believed that certain retinoids such as, for example, retinol (Vitamin A alcohol), retinal (Vitamin A aldehyde) and retinyl esters such as retinyl acetate and retinyl palmitate would be preferred over retinoic acid. A preferred form is retinol. This is because retinol is an endogenous compound naturally occurring in the human body and essential for good growth, differentiation of epithelial tissues and reproduction. Retinol is also preferred because it has a much larger safety margin than other retinoids such as retinoic acid. Additionally, excess retinol is stored in the human body largely in an inactive ester form, e.g. retinyl palmitate and, to some extent, retinyl acetate. The aldehyde, retinal, also a preferred form, is an active metabolite of retinol and is needed for visual function. Accordingly, attention has turned toward formulating skin care compositions which contain these preferred, naturally occurring retinoids.

In formulating products containing such retinoids, the same properties sought with respect to the retinoic acid formulas are desirable for other retinoid containing compositions. Specifically, much attention is directed toward providing a composition which is aesthetically pleasing and which can deliver active ingredients after a substantial shelf life. Not surprising, in formulating products containing such retinoids, the art is led to the experience gained in the already existing formulas

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containing retinoic acid. Typically, such formulas comprise oil-in-water emulsions wherein the retinoic acid is carried within the oil phase and is protected from oxidation by employing an oil-soluble antioxidant. With
5 respect to the form of the emulsion, oil-in-water emulsions have been preferred in that, as compared to water-in-oil emulsions for example, they are non-occlusive, non-greasy, compatible with other such emulsion products, easy to remove from the skin and are regarded as
10 more aesthetically pleasing as well as being more economical to manufacture. With respect to chemical stability of the active ingredient, it has been experienced that the retinoic acid in the oil phase is, in the main, well protected by including in such oil phase an
15 oil soluble antioxidant.

Thus, for example, the aforementioned Retin A* cream is an oil-in-water emulsion containing retinoic acid and BHT, an oil-soluble antioxidant. In U.S. Patent 3,906,108
20 there is disclosed an oil-in-water emulsion of retinoic acid which may include an oil-soluble antioxidant such as BHT or dl-a-tocopherol and a chelating agent e.g. ethylenediaminetetraacetic acid (EDTA). In U.S. patent No. 4,466,805, a tanning composition is described which
25 may include, among other ingredients, Vitamin A in an oil-in-water emulsion containing Vitamin E and citric acid. In U.S. Patent No. 4,247,547 still another form of a retinoic acid containing composition, namely a gel, is disclosed and is protected by an antioxidant selected from
30 the group consisting of butylated hydroxytoluene,

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butylated hydroxyanisole (BHA), ascorbic acid (Vitamin C), propyl gallate, and a-tocopherol (Vitamin E).

5 In U.S. Patent No. 4,826,828 it is suggested that a stable composition comprising retinol, retinyl acetate and retinyl palmitate may consist of retinol in a water-in-oil emulsion wherein the emulsion further include two oil-soluble antioxidants, BHT and BHA.

10 Further, Avon Products, Inc., the assignee of U.S. 4,826,828, sells two skin care products called Bioadvance and Bioadvance 2000. Each of these products is supplied in two bottles, portions of which are mixed together just prior to use. The first bottle contains what is called
15 "skin lotion:", while the second bottle contains what is called a "fortifier". The "skin lotion" is a water-in-oil emulsion having a number of ingredients which include water, emulsifiers, silicone and vegetable oils, preservatives, emollients and butylated hydroxytoluene
20 (BHT). The "fortifier" is a solution which contains a number of ingredients including cyclomethicone (a silicone oil), denatured ethanol, an emulsifier (Polysorbate 20), retinol, retinyl acetate, retinyl palmitate, BHT and BHA. When a specified portion of the "fortifier" is added to a
25 specified portion of the "skin lotion" and mixed, there results a water-in-oil emulsion which comprises retinol, retinyl acetate, retinyl palmitate, BHT and BHA, the latter being oil-soluble antioxidants. The outer package in which Bioadvance is supplied carries a statement which
30 says "Because BIOADVANCE begins to lose effectiveness after one month, for maximum benefits, use a fresh supply

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each month". It would appear from this statement that the chemical stability of the retinoids in the mixture of the "skin lotion" and the fortifier" is quite limited. The fact that in both the BIOADVANCE and BIOADVANCE 2000 products the "fortifier" ingredients must be mixed with the "skin lotion" ingredients immediately prior to use indicates that the resulting water-in-oil emulsion which is applied to the skin also has limited chemical stability of one or more of the above-mentioned retinol, retinyl acetate and retinyl palmitate.

Further still, U.S. Patent No. 4,720,353 to Bell discloses water-in-oil emulsion carriers for various medicaments and drugs intended for topical application to the skin. Water soluble, miscible or dispersible drugs may be incorporated into the aqueous phase of the emulsion. Oil-soluble, miscible or dispersible drugs may be incorporated into the oil phase. Drugs which may be incorporated into the emulsion include derivatives of retinoic acid. Ingredients which may optionally be added to the emulsion include a preservative such as methyl paraben, propyl paraben or imidazolidinyl urea or an antioxidant such as butylated hydroxyanisole and a water or oil soluble vitamin such as vitamin C, tocopherol linoleate and the like.

Still further, EP 0 343 444 A2 to Siemer et al. discloses cosmetic preparations based on retinyl palmitate. Example 3 discloses a night cream in the form of an water-in-oil type emulsion comprising retinyl palmitate and butylated hydroxyanisole (BHA). Example 4

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describes a water-in-oil emulsion comprising retinyl acetate and a-tocopherol (Vitamin E).

5 Still further, EP 0 330 496 A2 to Batt is directed to skin treatment compositions comprising a topically acceptable base and an effective amount of at least one ester of retinol, said compositions being useful in the treatment of photoaged skin. Example 6 describes a water-in-oil emulsion comprising Vitamin A propionate and BHT,
10 an oil-soluble antioxidant.

U.S. Patents Nos. 5,559,149 and 5,652,263 (Wang et al.), describe water-in-oil emulsions which provide a stable retinol formulation. U.S. Serial Nos. 08/523,836,
15 08/609,588, and 08/807,351 describe oil-in-water emulsions which provide a stable retinol formulation. U.S. Serial No. 08/902,922 describes liposome-containing formulations which provide stable retinol formulations.

20 The topical application of retinoid-containing compositions is well-known to result in beneficial skin changes. Retinoids effect treatment for acne and skin damage due to exposure to sunlight. However, the topical application of retinoids can cause significant
25 irritation characterized by erythema, redness, scaling, edema or itching. Many attempts have been made to reduce irritation associated with the application of retinoids to the skin.

For example, U.S. Patent No. 5,470,567 describes a
30 composition containing retinoids and 4-hydroxyanisole which does not contain corticosteroids yet exhibits

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diminished irritation. Similarly, U.S. Patent No. 4,727,088 describes an emulsified formulation which contains fatty alcohols and results in reduced irritation.

5 U.S. Patent No. 5,061,692 describes reducing irritation by topically applying specific penta-peptides or their salts to the skin in addition to the retinoid compositions.

10 Other methods of reducing retinoid-induced irritation have been suggested. For example, U.S. Patent No. 5,075,340 describes the use of certain derivatives of retinoic acid in the compositions, such as retinoic acid glucuronide, to avoid skin irritation.

15 Irritation due to retinoids has also been mitigated through the use of different types of delivery systems.

European Patent application No. EP 472225 describes a pharmaceutical composition based on hydrated lamellar phases or liposomes which contain retinoic acid as the
20 active material, which is said to reduce the irritation while maintaining activity or efficacy.

U.S. Patent No. 4,911,928 describes another type of lipid vesicle, the paucilamellar vesicles (PLV) which have a capacity of transporting a greater amount of
25 lipophilic material. A subsequent patent, U.S. 5,147,723, describes non-phospholipid surfactants which can form paucilamellar vesicles.

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None of the previous suggestions has proven to be low in irritation, as the retinoids contained in these products are quite potent and very irritating. It is therefore, desirable to develop skin care products
5 containing retinoids which are not only efficacious and cosmetically elegant, but substantially free of harsh irritating side effects which discourage continued use of retinoids for treatment of skin conditions.

It is another object of this invention to provide
10 skin care compositions containing retinoids which have little or no irritancy and which do not necessitate special ingredients or manufacturing, storage, handling precautions.

15 SUMMARY OF THE INVENTION

It has now been discovered that, unexpectedly, retinoid-containing compositions may be formulated that exhibit good efficacy, cosmetic elegance but which
20 induce only very low irritation.

The compositions of this invention contain (a) a retinoid compound, such as retinoic acid, retinol, retinaldehyde and/or various other known related retinoid compounds including esters of retinoic acid and
25 the like; (b) an oil-soluble antioxidant; and (c) emulsifiers or surfactants in a pharmaceutically and cosmetically acceptable vehicle in which the combination of components is particularly non-irritating together with said retinoid compound. Similar retinoid-
30 containing compositions may be found in co-pending U.S.

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patent application Serial No. 08/415,975, which is hereby incorporated herein by reference.

5 The compositions of this invention are preferably emulsions, the emulsions preferably containing an oil phase having ingredients which may be made into paucilamellar vesicle, although it has been found that such vesicles need not be formed in order to achieve a low-irritation product. As described above, the
10 composition of the invention is in the form of a particular type of emulsion, namely oil-in-water. As used herein, the generally accepted concept of an emulsion applies, i.e., an intimate mixture of two immiscible liquids which remains unseparated for an
15 acceptable shelf life at or about room temperature. Ordinarily, when two immiscible liquids are mechanically agitated, both phases initially tend to form droplets. Thereafter, when the agitation ceases, the droplets quickly coalesce, and the two liquids tend to separate.

20 On the other hand, an emulsion may be formed and physically stabilized and the lifetime of the droplets in intimate mixture materially increased if a compound, referred to as an emulsifier, is added to the immiscible liquids. Usually only one phase persists in droplet
25 form for a prolonged period of time, and this is referred to as the internal phase which is surrounded by an external phase. An oil-in-water emulsion is one in which the external phase (also called the continuous phase) comprises water or an aqueous solution and the
30 internal phase (also called the discontinuous or

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disperse phase) comprises an oil or mixture of mutually soluble oils.

Also preferably, the compositions of this invention contain liposomes. Liposomes are vesicular lipid membrane structures enclosing a volume of water. X-ray diffraction studies depict liposomes as being composed of organized lipid bilayers which swell in water to form hydrated multilamellar layers that are separated by thin films of water. These bilayers are composed of amphophilic molecules, which possess both hydrophilic and lipophilic properties. The lipid vesicles may be made of phospholipid, single chain nonphospholipid or zwitterionic surfactants. Because of its hydrophobic nature, each bilayer forms a closed membrane with its apolar residues sequestered away from water. Hydrophobic molecules such as retinol will therefore reside in the closed membranes and will not be as likely to be subject to oxidative degradation. Suspensions of liposome vesicles may be described as water-in-oil-in-water (w/o/w) systems. Generally, they are more cosmetically elegant and less greasy than water-in-oil (w/o) emulsions. However, such liposome vesicles need not be formed in order to achieve a low-irritation product. For example, the oil phase of the compositions may contain glyceryl distearate and cholesterol and the like, which are wall-forming surfactants. Other fatty alcohols such as stearyl alcohol may also form a portion of the compositions of this invention.

The retinoids which can be utilized in the products of this invention such that their irritation is reduced

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upon application to the skin in accordance with the principles of the present invention include retinol (Vitamin A alcohol), retinal (Vitamin A aldehyde), retinyl acetate, retinyl palmitate and mixtures thereof.

5

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As described above, the composition of the invention is in the form of a particular type of emulsion. Most commercial skin care compositions such as the ones containing retinoic acid are oil-in-water emulsion systems. However, in the known commercial systems, certain retinoid compounds, in particular retinol, retinal, retinoic acid, and the retinyl esters, tend to cause substantial irritation to the skin.

The compositions of this invention overcome this difficulty and, instead, provide a composition containing at least one retinoid compound wherein the irritation caused by the retinoid is significantly reduced. The compositions of this invention may be in the form of an emulsion or may contain liposome vesicles.

As used herein, the generally accepted concept of an emulsion applies i.e., an intimate mixture of two immiscible liquids which remains unseparated for an acceptable shelf life (is physically stable) at or about room temperature. Ordinarily, when two immiscible liquids are mechanically agitated, both phases initially tend to form droplets. Thereafter, when the agitation ceases, the droplets quickly coalesce, and the two liquid tends to

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separate. On the other hand, an emulsion may be formed and physically stabilized and the lifetime of the droplets in intimate mixture materially increased if a compound, referred to as an emulsifier, is added to the immiscible liquids. Usually only one phase persists in droplet form for a prolonged period of time, and this is referred to as the internal phase which is surrounded by an external phase. An oil-in-water emulsion is one in which the external phase (also called the continuous phase comprises water and the internal phase (also called the discontinuous or disperse phase) comprise an oil. A water-in-oil emulsion is one in which the external phase comprises an oil and the internal phase comprises water.

Liposomes are spherical, self-closed structures composed of curved lipid bilayers which entrap part of the solvent, in which they freely float, into their interior. They may consist of one or several concentric membranes.

Liposomes are made predominantly from amphiphiles, a special class of surface active molecules, which are characterized by having a hydrophilic and a hydrophobic group on the same molecule. These molecules are not soluble in water; and, rather than forming solutions, they form colloidal dispersions. Paucilamellar lipid vesicles, of the type described in U.S. Patents Nos. 4,911,928 and 5,147,723, which are hereby incorporated herein by reference, can be utilized in the compositions of this invention.

It is also preferable to have at least one oil-soluble antioxidant in the compositions of this invention. The oil-soluble antioxidants which are

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useful in the compositions of the present invention include butylated hydroxytoluene (BHT), ascorbyl palmitate, butylated hydroxyanisole (BHA), α -tocopherol, phenyl- α -naphthylamine, hydroquinone, propyl gallate, nordihydroguaiaretic acid, and mixtures thereof as well as any other known oil-soluble antioxidant compatible with the other components of the compositions.

The oil-soluble antioxidants useful in the compositions of this invention should be utilized in a stabilizing effective amount and may range in total from about 0.001 to about 5% based on the weight of the total composition, preferably from about 0.01 to about 1%. The amount of antioxidants utilized in the compositions of the present invention is dependent in part on the specific antioxidants selected, the amount of and specific retinoid being protected and the processing conditions. For example, a retinol formulation should include BHT in the amount of from about 0.01% to about 1% by weight. a retinal formulation should include BHT in the amount of from about 0.01% to about 1% by weight.

The compositions of this invention may also include a chelating agent to minimize metal ion contamination. The retinoid compounds of this invention are sensitive to metal ions and in particular to bi- and tri-valent cations and in certain instances, appear to degrade rapidly in their presence. The chelating agent forms a complex with the metal ions thereby inactivating them and preventing them from affecting the retinoid compounds. Chelating agents which are useful in the compositions of this

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invention include ethylenediamine tetraacetic acid (EDTA) and derivatives and salts thereof, dihydroxyethyl glycine, citric acid, tartaric acid, and mixtures thereof. The chelating agents should be utilized in a stabilizing effective amount and may range from about 0.01 to about 2% based on the weight of the total composition, preferably from about 0.05 to about 1%.

The retinoid compounds which are useful in the compositions of the present invention consist of Vitamin A alcohol (retinol), Vitamin A aldehyde (retinal) and Vitamin A esters (retinyl acetate and retinyl palmitate). These retinoids are utilized in the compositions of the present invention in a therapeutically effective amount that may range from about 0.001 to about 5% by weight of the total compositions, preferably from about 0.001 to about 1%.

The skin care compositions of the present invention comprising a water-in-oil emulsion can be in the format of cream or lotion formulations, as desired, by varying the relative quantities of the oil and water phases of the emulsion. The pH of the compositions should be in the range of from about 4 to about 9, and preferably from about 4 to about 7. Most preferably, the pH of the compositions should be at least 5.

Mineral oils, animal oils, vegetable oils and silicones have all been used in cosmetic creams and lotions of the emulsion type. In addition to such oils, other emollients and surface active agents have been

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incorporated in the emulsions, including glyceryl trioleate, acetylated sucrose distearate, sorbitan trioleate, polyoxyethylene (1) monostearate, glycerol monooleate, sucrose distearate, polyethylene glycol (50) monostearate, octylphenoxypoly (ethyleneoxy) ethanol, diglycerin penta-isostearate, sorbitan sesquioleate, hydroxylated lanolin, lanolin, triglyceryl diisostearate, polyoxyethylene (2) oleyl ether, calcium stearoyl-2-lactylate, methyl glucoside sesquistearate, sorbitan monopalmitate, methoxy polyethylene glycol-22/dodecyl glycol copolymer (Elfacos E200), polyethylene glycol-45/dodecyl glycol copolymer (Elfacos ST99), polyethylene glycol 400 distearate and glyceryl stearate; alcohols, such as cetyl alcohol and lanolin alcohol; myristates, such as isopropyl myristate; cetyl palmitate; cholesterol; stearic acid; propylene glycol; glycerine, sorbitol and the like. Thickeners such as natural gums and synthetic polymers, as well as preservatives such as methylparaben, butyl paraben, propylparaben and phenoxyethanol, coloring agents and fragrances also are commonly included in such compositions. Other active ingredients such as sunscreen materials and antimicrobial materials may be utilized in the compositions of the present invention provided that they are physically and chemically compatible with the other components of the compositions.

The essence of the present invention is not within the specific composition per se of the cream or lotion formulation, and any of the many formulations or compositions of the cream or lotion type currently utilized in skin care preparations can be employed

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provided that it is in a water-in-oil emulsion and is chemically compatible with the retinoid compounds. The ratio of the oil phase of the emulsion to the water phase can be from about 5:95 to about 40:60. The actual ratio
5 of the two phases will depend on the desired final product.

The skin care compositions of the present invention comprising an oil-in-water emulsion can be in the format
10 of cream or lotion formulations, as desired, by varying the relative quantities of the oil and water phases of the emulsion. The pH of the compositions should be in the range of from about 4 to about 10; preferably they should be from about 6 to about 8. It has been found
15 that, in compositions having a pH of about 6 or more, the retinoid is more stable than at pH of less than 6.

Preferably, glycerin is included in the formulations of this invention as a humectant, however, it should be present in relatively low amounts.
20 Preferably, the amount of glycerin should be less than 10% of the total composition. More preferably, it should be less than 5% of the total composition by weight. It is theorized that glycerin may enhance penetration of an active or irritating ingredient, thus
25 increasing the amount of its irritation-producing effects. Thus, glycerin should be present in the composition in a penetration-enhancing effective amount.

Preferably, the inclusion of irritating compounds should be avoided. For example, butylene glycol is
30 potentially irritating and may cause additional irritation in the type of formulations of this

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invention. Other potentially irritating compounds include soaps, amine-based compounds, surfactants, certain sunscreen active ingredients and compounds which cause the pH of the composition to become either
5 extremely acidic or extremely basic.

A branched-chain fatty alcohol ester such as octyl hydroxy stearate may also contribute to the mildness of the compositions of this invention. Other branched-chain fatty esters may be useful in mitigating the
10 irritating effects of the compositions of this invention.

The advantages of the invention and specific embodiments of the skin care compositions prepared in accordance with the present invention are illustrated by
15 the following examples. It will be understood, however, that the invention is not confined to the specific limitations set forth in the individual examples, but rather to the scope of the appended claims.

Example 1:

20 The following formula was made in accordance with the teachings of this invention. The oil phase and water phase were formed separately. The following oil phase ingredients (glyceryl distearate, cholesterol NF, POE 10 stearyl alcohol, cetareth 20 and stearyl
25 alcohol, cetareth 20 and cetearyl alcohol, stearyl alcohol) were blended together in a kettle and heated to 80°C with agitation. Once all the ingredients were melted, the temperature was held at 80°C for between about five to ten minutes, i.e., until all ingredients
30 were mixed uniformly. Cooling to 65°C was begun. When

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the temperature reached 70°C, BHT was added. When the temperature reached 65°C, the following ingredients were added: octyl hydroxystearate, cetyl acetate and acetylated lanolin, C₁₂₋₁₅ alkyl lactate, and polysorbate 80. Argon diffusion was begun and, subsequently, retinol added to the composition. The temperature was held at 65°C until the water phase was prepared and ready for addition.

The water phase was prepared as follows: deionized water was added to a kettle and the kettle slowly heated to 80°C. During the heating process, citric acid, sodium citrate and glycerin were added to the water. At 80°C, methylparaben and propylparaben were added. The mixture was held at 80°C for about five to ten minutes, i.e., until a uniform mixture was obtained. The two phases were then mixed together at 60°C in accordance with the procedure set forth in U.S. Patent No. 4,911,928 (Wallach) for making liposomes. The remaining ingredients were added after combination of the two phases and the mixture homogenized using a rotor-stator homogenizer.

	<u>CHEMICAL NAME</u>	<u>%W/W</u>
	<u>Water Phase</u>	
	Deionized water	62.490
25	Glycerin	4.000
	Citric Acid	0.130
	Sodium Citrate	4.750
	Sodium Chloride	0.100
	Methylparaben	0.200

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	Propylparaben	0.030
	<u>Oil Phase</u>	
	Glyceryl Distearate ¹	2.800
	Cholesterol, NF	1.000
5	Stearyl Alcohol	0.500
	POE10 Stearyl Alcohol ²	1.400
	Polysorbate 80 ³	0.700
	Ceteareth 20 & Stearyl Alcohol ⁴	3.000
	Ceteareth 20 & Cetearyl Alcohol ⁵	3.000
10	Octyl Hydroxystearate ⁷	6.190
	Cetyl Acetate & Acetylated Lanolin ⁸	1.000
	C ₁₂₋₁₅ Alkyl Lactate ⁹	1.500
	<u>Single Additions</u>	
	Vitamin A 40 in Polysorbate 20 ⁶	0.210
15	Silicone Emulsion TBM 35060	4.000
	Polyacrylamide, C ₁₃₋₁₄ Isoparaffin and Laureth-7 ¹⁰	3.000
	¹ Kessco GDS	
	² Brij 76	
20	³ Tween 80	
	⁴ Procol ST 20G, an emulsifier	
	⁵ Procol CS 20D, an emulsifier	
	⁶ Retinol in polysorbate 20 40% w/w	
	⁷ Wickenol 171	
25	⁸ Acetulan	
	⁹ Ceraphyl 41	
	¹⁰ TBM 35060, a silicon emulsion	

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¹¹ Sepigel 305, a thickener

The composition of Example 1 was tested in a modified RIPT (Draize) test as set forth in U.S. Patent Application Serial No. 08/415,975. The composition was applied repeatedly to the skin of volunteers. It resulted in extremely low irritation in terms of redness and swelling of the skin (Score = 11.5).

Example 2 (Comparative):

A composition of the following formula was made in accordance with the procedure set forth in Example 1.

	<u>CHEMICAL NAME</u>	<u>%W/W</u>
	<u>Water Phase</u>	
	Deionized water	58.898
	Glycerin	9.500
15	Butylene Glycol	9.500
	Citric Acid	0.120
	Sodium Citrate	4.530
	EDTA Disodium	0.100
	Methylparaben	0.200
20	<u>Oil Phase</u>	
	Glyceryl Monostearate	0.787
	Glyceryl Distearate ²	1.575
	Cholesterol, NF	1.977
	POE10 Stearyl Alcohol ³	1.240
25	Stearyl Alcohol	1.422
	Polysorbate 80 ⁸	0.500
	Caprylic/Capric Triglyceride ¹	4.256
	Vitamin A 40% w/w in polysorbate 20	
	0.165	
30	BHT	0.100

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	Vitamin E Acetate	0.100
	Propylparaben	0.030
	<u>Single Additions</u>	
	Cyclomethicone	2.000
5	Polyacrylamide, C ₁₃₋₁₄ Isoparaffin and Laureth-7	3.000
	¹ Miglyol 812	

This formulation has a retinol concentration of about 0.075% W/W and has a high irritation score as measured by the RIPT test (score = 377).

Example 3:

The following composition was made in accordance with the procedure set forth in copending U.S. Patent Application Serial No. 08/415,975 and contains 0.04% Retinol. The composition was made such that non-phospholipid liposomes comprising paucilamellar vesicles were created.

	<u>CHEMICAL NAME</u>	<u>%W/W</u>
20	Deionized water	62.490
	Glycerin	4.000
	Citric Acid	0.130
	Sodium Citrate	4.750
	Sodium Chloride	0.100
25	Methylparaben	0.200
	Octylhydroxystearate ¹	6.288
	Glyceryl Distearate ²	2.800
	Cholesterol, NF	1.000
	POE10 Stearyl Alcohol ³	1.400
30	Ceteareth 20 and Stearyl Alcohol ⁴	3.000

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	Ceteareth 20 and Cetearyl Alcohol ⁵	3.000
	Stearyl Alcohol	0.500
	Cetyl Acetate and Acetylated	
	Lanolin ⁶	1.000
5	C ₁₂₋₁₅ Alkyl Lactate ⁷	1.500
	Polysorbate 80 ⁸	0.700
	Propylparaben	0.030
	Vitamin A/Polysorbate 20 ⁹	0.112
	Silicon Emulsion ^a	4.000
10	Polyacrylamide, C ₁₃₋₁₄ Isoparaffin	3.000
	and Laureth-7 ¹¹	

Note:

- 1: Wickenol 171, a skin conditioner
- 2: Kessco GDS, an emulsifier
- 15 3: Brij 76, an emulsifier
- 4: Procol ST 20G, an emulsifier
- 5: Procol CS 20D, an emulsifier
- 6: Acetulan, a skin conditioner
- 7: Ceraphyl 41, an emulsifier
- 20 8: Tween 80, an emulsifier
- 9: Retinol 50P, a 50% w/w retinol solution in Polysorbate 20.
- 10: TBM 35060, a silicon emulsion
- 11: Sepigel 305, a thickener
- 25 ^a TBM 35060

This formulation resulted in low irritation when placed on the skin with excellent tolerance when used daily for

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a four-month period when compared with other retinol containing products under the same test conditions.

Example 4:

5 The following formulation was made in accordance with the process set forth in Example 1.

	<u>CHEMICAL NAME</u>	<u>% W/W</u>
	<u>Water Phase</u>	
	Deionized Water	62.490
	Octyl Hydroxy Stearate	5.628
10	Cholesterol	1.000
	POE 10 Stearyl Alcohol	1.400
	Ceteareth 20 and Stearyl Alcohol	3.000
	Ceteareth 20 and Cetearyl Alcohol	3.000
	Stearyl Alcohol	0.500
15	Cetyl Acetate and Acetylated Lanolin	1.000
	C12-15 Alkyl Lactate	1.500
	Retinol 40% w/w in Polysorbate 20	0.772
	Citric Acid	0.130
	Sodium Citrate	4.750
20	Sodium Chloride	0.100
	Glycerin	4.000
	Polysorbate 80	0.700
	Methyl Paraben	0.200
	Propyl Paraben	0.030
25	Silicon Emulsion (TBM 35060)	4.000
	Polyacrylamide, C13-14 Isoparaffin and Laureth-7	3.000

30 This composition had an irritation score equivalent to that of a comparative formula containing only one-half the amount of retinol in a water-in-oil emulsion containing purified water (49.484%), glycerin (10%), PEG

- 25 -

150 (1%), butylene glycol (4%), trisodium EDTA (0.10%),
ascorbic acid (0.10%), sodium citrate (0.10%),
pentaerythritol tetraoctanoate (5%), squalene (15%)
macademia nut oil (7%), petrolatum (3%), polyglyceryl-2-
5 diisostearate (2%), quaternium 18 hectorite (2.7%),
butylparaben (0.10%), ethylparaben (0.10%), BHT (0.05%),
tocopheryl acetate (0.10%) and retinol (0.166%).

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Example 5:

The following formulation was made in accordance with the procedure set forth in Example 1.

	<u>CHEMICAL NAME</u>	<u>% W/W</u>
5	Deionized Water	62.490
	Glycerin	4.000
	Citric Acid	0.130
	Sodium Citrate	4.750
	Sodium Chloride	0.100
10	Polysorbate 80	0.200
	Methyl Paraben	0.200
	Propyl Paraben	0.030
	Octyl Hydroxy Stearate	5.980
	Glyceryl Distearate	2.800
15	Cholesterol	1.000
	POE 10 Stearyl Alcohol	1.400
	Ceteareth 20 and Stearyl Alcohol	3.000
	Ceteareth 20 and Cetearyl Alcohol	3.000
	Stearyl Alcohol	0.500
20	Cetyl Acetate and Acetylated Lanolin	1.000
	Retinol 50% w/w	0.420
	C ₁₂₋₁₅ Alkyl Lactate	1.500
	Silicone Emulsion TBM 35060	4.000
	Polyacrylamide, C13-14 Isoparaffin	
25	and Laureth-7	3.000

This formulation resulted in very low irritation on human skin.

Example 6:

The following formulation was made in accordance with the procedure set forth in Example 1 and differs

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from Example 5 in that C₁₂₋₁₅ Alkyl Lactate was omitted from the formulation.

	Deionized Water	62.490
	Glycerin	4.000
5	Citric Acid	0.130
	Sodium Citrate	4.750
	Sodium Chloride	0.100
	Polysorbate 80	0.700
	Methyl Paraben	0.200
10	Propyl Paraben	0.030
	Octyl Hydroxy Stearate	7.510
	Glyceryl Distearate	2.800
	Cholesterol	1.000
	POE 10 Stearyl Alcohol	1.400
15	Ceteareth 20 and Stearyl Alcohol	3.000
	Ceteareth 20 and Cetearyl Alcohol	3.000
	Stearyl Alcohol	0.500
	Cetyl Acetate and Acetylated Lanolin	1.000
	Retinol 40% w/w	0.390
20	Silicone Emulsion TBM 35060	4.000
	Polyacrylamide, C13-14 Isoparaffin and Laureth-7	3.000

This formulation resulted in very low irritation on human skin similar to that of the formulation of Example 5.

Example 7:

The following formulation was made in accordance with the procedure set forth in Example 1. It has a lower buffer salt concentration than the formulation set forth in Example 5.

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	Deionized Water	67.240
	Glycerin	4.000
	Citric Acid	0.130
	Sodium Chloride	0.100
5	Polysorbate 80	0.700
	Methyl Paraben	0.200
	Propyl Paraben	0.030
	Octyl Hydroxy Stearate	6.010
	Glyceryl Distearate	2.800
10	Cholesterol	1.000
	POE 10 Stearyl Alcohol	1.400
	Ceteareth 20 and Stearyl Alcohol	3.000
	Ceteareth 20 and Cetearyl Alcohol	3.000
	Stearyl Alcohol	0.500
15	C12-C15 Alkyl Lactate	5.000
	Cetyl Acetate and Acetylated Lanolin	1.000
	Retinol 40% w/w	0.390
	C12-15 Alkyl Lactate	1.500
	Silicone Emulsion TBM 35060	4.000
20	Polyacrylamide, C13-14 Isoparaffin and Laureth-7	3.000

This formulation contains approximately 0.15% retinol.
This formulation resulted in higher irritation on human
25 skin than that of the other examples.

Example 8:

The following formulation was made in accordance
with the procedure set forth in Example 1, which differs
from Example 5 in that the sodium citrate buffer is
30 substituted with dibasic sodium phosphate.

Deionized Water	65.240
-----------------	--------

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	Glycerin	4.000
	Citric Acid	0.130
	Dibasic Sodium Phosphate	0.500
	Sodium Chloride	0.100
5	Polysorbate 80	0.700
	Methyl Paraben	0.200
	Propyl Paraben	0.030
	Octyl Hydroxy Stearate	2.510
	Glyceryl Distearate	2.800
10	Cholesterol	1.000
	POE 10 Stearyl Alcohol	1.400
	Ceteareth 20 and Stearyl Alcohol	3.000
	Ceteareth 20 and Cetearyl Alcohol	3.000
	Stearyl Alcohol	0.500
15	Cetyl Acetate and Acetylated Lanolin	1.000
	Retinol 40% w/w	0.390
	Retinol 50% W/W	0.390
	Silicone Emulsion TBM 35060	4.000
	Polyacrylamide, C ₁₃₋₁₄ Isoparaffin	
20	and Laureth-7	3.000
	This formulation resulted in relatively high irritation on human skin, similar to that of Example 4 (comparison formulation) and Example 7.	

25 Examples 9A and 9B:

The following formulations have the same chemical composition, however 9A was processed in accordance with the procedure set forth in Example 1, which results in paucilamellar vesicles, whereas formulation 9B was

30 processed using only the rotor-stator homogenizer after blending of the oil and water phases.

- 30 -

	<u>CHEMICAL NAME</u>	<u>%W/W</u>
	Deionized water	62.490
	Glyceryl Distearate	2.800
	Octyl Hydroxystearate	5.980
5	Cholesterol, NF	1.000
	Citric Acid	0.130
	Sodium Citrate	4.750
	Ceteareth 20 & Stearyl Alcohol	3.000
	Ceteareth 20 & Cetearyl Alcohol	3.000
10	POE10 Stearyl Alcohol	1.400
	Cetyl Acetate & Acetylated Lanolin	1.000
	Stearyl Alcohol	0.500
	Silicone Emulsion TBM 35060	4.000
	Glycerin	4.000
15	Methylparaben	0.200
	Propylparaben	0.030
	Sodium Chloride	0.100
	Polysorbate 80	0.700
	C ₁₂₋₁₅ Alkyl Lactate	1.500
20	Retinol 40% W/W	0.420
	Polyacrylamide, C ₁₃₋₁₄ Isoparaffin and Laureth-7	3.000
	The irritation ratings for the use of both of these compositions were very low.	

25

Thus, substantially non-irritating compositions containing retinoid compounds may be made using the compositions of this invention.

Example 10:

30

The following formulation was made in accordance with the procedure set forth in Example 1.

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	<u>CHEMICAL NAME</u>	<u>% W/W</u>
	Octyl hydroxystearate	6.2942
	Glyceryl distearate	2.8000
	Cholesterol	1.0000
5	POE 10 Stearyl alcohol	1.4000
	Ceteareth 20 & Stearyl alcohol	3.0000
	Ceteareth 20 & Cetearyl alcohol	3.0000
	Stearyl alcohol	0.5000
	Cetyl acetate & acetylated lanolin	1.0000
10	C12-15 Alcohols lactate	1.5000
	Retinol (50% w/w in Polysorbate 20)	0.1058
	BHT	0.1000
	Citric acid anhydrous	0.1500
	Trisodium citrate dihydrate	0.8500
15	Ascorbic acid	0.0100
	Glycerin	4.0000
	Polysorbate 80	0.7000
	Disodium EDTA	0.2000
	Phenoxyethanol	0.7300
20	Methyl paraben	0.2500
	Propyl paraben	0.1500
	Dimethicone, 100 cst	2.5000
	Polyacrylamide, C13-14 Isoparaffin and Laureth-7	0.5000
25	Fragrance	0.0500
	Water	69.2100

This formulation had a pH of about 5.6 and resulted in very low irritation on human skin.

Example 11:

- 30 The following formulation was made in accordance with the procedure set forth in Example 1.

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	<u>CHEMICAL NAME</u>	<u>% W/W</u>
	Octyl hydroxystearate	6.1355
	Glyceryl distearate	2.8000
	Cholesterol	1.0000
5	POE 10 Stearyl alcohol	1.4000
	Ceteareth 20 & Stearyl alcohol	3.0000
	Ceteareth 20 & Cetearyl alcohol	3.0000
	Stearyl alcohol	0.5000
	Cetyl acetate & acetylated lanolin	1.0000
10	C12-15 Alcohols lactate	1.5000
	Retinol (50% w/w in Polysorbate 20)	0.2645
	BHT	0.1000
	Citric acid anhydrous	0.0300
	Trisodium citrate dihydrate	1.0330
15	Ascorbic acid	0.0100
	Glycerin	4.0000
	Polysorbate 80	0.7000
	Disodium EDTA	0.2000
	Phenoxyethanol	0.7300
20	Methyl paraben	0.2500
	Propyl paraben	0.1500
	Dimethicone, 100 cst	2.5000
	Polyacrylamide, C13-14 Isoparaffin and Laureth-7	0.5000
25	Fragrance	0.0500
	Water	69.1970
	This formulation had a pH of about 6.2 and resulted in very low irritation on human skin.	

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WHAT IS CLAIMED IS:

1. A cosmetic composition comprising: (a) a retinoid compound; (b) an oil-soluble antioxidant; and (c) a
5 compound selected from the group consisting of emulsifiers or surfactants, said composition being substantially free of irritating compounds.
2. A cosmetic composition according to claim 1 wherein
10 said composition further comprises a branched-chain fatty alcohol ester.
3. A cosmetic composition according to claim 2 wherein
15 said retinoid compound is selected from the group consisting of retinoic acid, retinol, retinaldehyde and esters of retinoic acid.
4. A cosmetic composition according to claim 2 wherein
20 said oil-soluble antioxidant is selected from the group consisting of butylated hydroxytoluene (BHT), ascorbyl palmitate, butylated hydroxyanisole (BHA), a-tocopherol, phenyl-a-naphthylamine, hydroquinone, propyl gallate, nordihydroguaiaretic acid, and mixtures thereof.
- 25 5. A cosmetic composition according to claim 1 wherein said irritating compounds are selected from the group consisting of: butylene glycol, soaps, amine-based compounds, surfactants, sunscreen active ingredients, low-
30 pH acids and high-pH bases.

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6. A cosmetic composition according to claim 5 wherein said irritating compound is butylene glycol.
7. A composition according to claim 4 wherein said oil-soluble anti-oxidant is butylated hydroxytolune.
8. A composition according to claim 3 wherein said retinoid is retinol.
9. A composition according to claim 1 wherein said composition further comprises a chelating agent.
10. A composition according to claim 2 wherein said branched-chain fatty alcohol ester is octyl hydroxy stearate.

INTERNATIONAL SEARCH REPORT

Inten. Jnal Application No
PCT/US 97/17939

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61K7/48

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 094 771 A (BEECHEM GROUP PLC) 23 November 1983 see the whole document ---	1,2,4-7
X	EP 0 408 370 A (BRISTOL-MYERS COMPANY) 16 January 1991 see the whole document ---	1,3-7,9
X,P	WO 96 31194 A (JOHNSON & JOHNSON CONSUMER PRODUCTS) 10 October 1996 cited in the application see the whole document ---	1,3,4, 7-9
X	EP 0 631 772 A (JOHNSON & JOHNSON CONSUMER PRODUCTS) 4 January 1995 see the whole document ---	1,3,4, 7-9
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
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X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

Z document member of the same patent family

Date of the actual completion of the international search

17 February 1998

Date of mailing of the international search report

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Fischer, J.P.

INTERNATIONAL SEARCH REPORT

Inter. Appl. Application No
PCT/US 97/17939

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>DATABASE WPI Week 9309 Derwent Publications Ltd., London, GB; AN 93-071026 XP002055860 & JP 05 017 350 A (LION CORP.) see abstract</p>	1,3-8
X,P	<p>--- WO 97 31620 A (JOHNSON & JOHNSON CONSUMER PRODUCTS) 4 September 1997 see the whole document -----</p>	1-4,7-10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 97/17939

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

Claims Nos.: see below

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

The term "substantially free of irritating compounds" in claim 1 and the terms "amine-based compounds, surfactants, low-pH acids and high-pH bases, soaps, sunscreen active ingredients" are not sufficiently defining chemical compounds in structural terms to enable a complete search.

Claims searched: 1-10 partially

INTERNATIONAL SEARCH REPORT

information on patent family members

Inter. .onal Application No

PCT/US 97/17939

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 94771 A	23-11-83	CA 1196285 A DK 215983 A,B, JP 1771826 C JP 4063043 B JP 58208207 A US 5037850 A	05-11-85 16-11-83 14-07-93 08-10-92 03-12-83 06-08-91
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